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## THE LOST ART OF MARITIME MINING

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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**THE LOST ART OF MARITIME MINING**

Maritime minefields have been employed to achieve strategic and operational objectives in the five major American wars of the 20th century. The United States has been both the miner and, most recently, the victim. Mining can strike at the heart of the enemy, take advantage of an Achilles' heel, or compensate for one's own weakness. The U.S. Navy maintains a modest inventory of mines which can be laid in volume by Navy and Air Force aircraft, or covertly by submarines. Today's operational commander faces an increasingly challenging task: tackle a diverse, changing threat with fewer forces and resources without alienating the American public. Minefields can be an integral part of the plan to achieve battlespace dominance and project power. Mining can seize the initiative through surprise, enhance mass and maneuver by achieving economy of force, and expand the commander's battlespace and timeline while compressing those of the enemy. A minefield is a stealthy, persistent, and economical weapon which can deter without killing. Against a maritime foe, the operational commander should consider mining's strategic and operational potential when planning a major operation.

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## PREFACE

As with any research work, it is important to define what one is talking about. Terminology in this warfare area seems to be employed interchangeably. This paper will address a "minefield" as a weapon of strategic or operational stature, whereas a "mine" implies a tactical weapon. The phrase "maritime minefield" is employed rather than "naval minefield" to imply jointness and because the minefield may have effects beyond the naval realm. For brevity, "minefield," "mining," and "mine" are often used in this paper in place of "maritime minefield," "maritime mining," and "naval mine," respectively. Likewise, "commander" refers to an operational level commander.

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# THE LOST ART OF MARITIME MINING

## CHAPTER I

### INTRODUCTION

I cannot overestimate the fact that both mines and mine countermeasures constitute fundamental building blocks of naval power.<sup>1</sup>

ADM Frank Kelso  
Chief of Naval Operations

The naval mine was invented by an American, Robert Fulton, in the late 18th century, and was effectively employed in numerous conflicts by naval forces of the United States during the next one hundred years. Maritime minefields were used as strategic or operational level weapons in each of the five major wars fought by the United States in this century. Today's threat to the American way of life is no longer embodied by a militaristic, threatening Soviet bear but rather comes from many diverse areas. The U.S. Commander in Chief declared that "our nation can only address this era's dangers and opportunities if we remain actively engaged in global affairs."<sup>2</sup> Every major conflict now has global repercussions, and national self-interest requires U.S. involvement in them. The Navy has redefined its strategic missions in light of the new world realities via ...From the Sea and Forward...from the Sea. Both papers emphasize the requirement to achieve battlespace dominance and project power, usually with fewer forces and in a littoral setting. Forward states that "the most important role of

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<sup>1</sup>Frank B. Kelso, "Building Blocks of Naval Power," US Naval Institute Proceedings, November 1992, p. 44.

<sup>2</sup>U.S. President, A National Security Strategy of Engagement and Enlargement (Washington: 1994), p. ii.

naval forces in situations short of war is to be engaged in forward areas, with the objectives of preventing conflicts and controlling crises."<sup>3</sup> In a battlespace seemingly dominated by Aegis destroyers and nuclear aircraft carriers, mine warfare does not appeal to the modern U.S. high-tech naval warrior. Americans believe that a good offense is the best defense; unfortunately, mining is viewed by many as a strategy employed by technically inferior nations for sea denial. But history shows that maritime minefields can contribute significantly towards achieving battlespace dominance, and can effectively project power. Mining can attack enemy centers of gravity (COG's) which are impenetrable by other weapons, or they can be used to defend critical weaknesses. Minefields can be used across the spectrum of warfare, providing operational fires unmatched in terms of stealth, persistence, and economy of forces and resources. Mining is a rusty tool in the operational artist's tool belt which should be cleaned, closely examined, and put to use.

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<sup>3</sup>U.S. Navy dept., Forward...from the Sea, (Washington: 1994), p. 1. Emphasis in the original.



## CHAPTER II

### A SELECTED HISTORY OF MINING

Maritime minefields were employed in the five modern American wars: World War I, World War II, Korea, Vietnam, and the Persian Gulf.

#### World War I

German submarines were the primary threat to Allied sea lines of communication (SLOC's). Lt Cdr Maurice Griffiths stated that the "losses of merchant ships with their desperately needed cargoes were becoming so great in the second half of 1917 that those in the know realized that if no effective counter-measures could be put in force, Great Britain was in real danger through strangulation."<sup>4</sup> In 1918, Allied forces planted over 72,000 mines in the North Sea, making passage out of the Baltic hazardous to the U-boats and allowing Allied surface forces to be concentrated elsewhere. 89 of the 132 submarines lost during the war were sunk by mines.

#### World War II

In 1942, German U-boats mined four east coast U.S. harbors, closing them to shipping and more importantly bringing the war home to Americans. The British employed vast minefields along their own coasts to protect shipping, declaring the entire area dangerous (despite the use of dummy mines in some areas). Minefields off of Greenland and Iceland forced the Bismarck into a choke point, where it was discovered and sunk. Of note, functional WW II mines were

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<sup>4</sup>Maurice Griffiths, The Hidden Menace (Greenwich: Conway Maritime Press, 1981), p. 56.

found in the Baltic by U.S. MCM ships in 1993.

In the Pacific, Japan had acquired a vast empire which depended upon SLOC's to transfer raw materials to Japan and to supply deployed troops. Mining against Japan was a joint venture between the Navy and the Army, whose cooperation "in the mining campaign was exemplary in all theaters."<sup>5</sup> Allied mining operations, designed to cut these SLOC's, were carried out in two stages. First, over 13,000 mines were targeted at shipping in the outer zone of the empire or in support of the Allied maritime campaign. In 1943, two U.S. aircraft dropped six mines in Haiphong harbor, sinking three ships and closing the port to Japanese steel-hulled ships for the remainder of the war. Submarines laid over 600 mines in the Pacific, usually in areas beyond aircraft range or when secrecy was desired. U.S. forces pre-emptively mined Truk and Woleai in 1944 "to prevent temporarily their use by any enemy fleet units which might endanger the Hollandia invasion and other movements then being carried on."<sup>6</sup> U.S. mining trapped 32 Japanese naval ships in Palau harbor, forcing the Japanese to abandon it as a naval base. Dummy minefields closed the Port of Rangoon to steel-hulled ships in 1945. The intelligence officer of the East Indies Station noted that because of Allied mining, "the morale of [Japanese] ships [sic] crews and the morale of the troops on board

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<sup>5</sup>U.S. Navy dept., "The Offensive Mine Laying Campaign Against Japan," U.S. Strategic Bombing Survey (Washington: 1946), p. 26.

<sup>6</sup>Navy, Strategic Bombing, p. 12.

transports deteriorated."<sup>7</sup>

In stage two, termed Operation Starvation, over 12,000 mines were laid to close the inner zone around Japan to maritime traffic. Japanese naval leaders were unprepared for the attack on their inland waters. 670 Japanese ships were sunk, against the loss of 15 B-29 aircraft (or 45 ships lost per aircraft lost).<sup>8</sup> Mines sunk more ship tonnage in the last six months of the war than all other sources, despite using less than six percent of the Pacific theater B-29 sorties (with less than one percent of the planes employed lost).<sup>9</sup> Another measure of effectiveness (MOE) compared the U.S. investment per Japanese shipping ton casualty: mining cost \$16, while submarines cost \$100. Most MOE's did not count indirect mining casualties, such as the Yamato (which was sighted and sunk after being forced to avoid the mined Shimonoseki Strait). Minelaying did not arouse enemy passions because there was no apparent damage or bloodshed. At Niigata, "numerous American prisoners of war observed an inexplicable enthusiasm on the part of the local populace every time a Japanese ship was mined."<sup>10</sup> Army air force heavy bombers put 92.8% of their mines on target, but the small percentage not on target resulted in 850 mines being

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<sup>7</sup>Ibid., p.4.

<sup>8</sup>Arnold S. Lott, "Japan's Nightmare - Mine Blockade," US Naval Institute Proceedings, November 1959, pp. 50-51.

<sup>9</sup>John S. Chilstrom, "A Test for Joint OPS: USAAF Bombing Doctrine and the Aerial Minelaying Mission," Air Power History, Spring 1993, p. 38.

<sup>10</sup>Navy, Strategic Bombing, p.29.

scattered over beaches, rice paddies, and mountain tops.<sup>11</sup> One historian goes so far as to postulate that had the mining of Japan begun earlier (as the Navy wanted), "almost certainly, increased shipping losses plus reduced imports would have brought the Japanese, even before the first atomic bomb exploded at Alamogordo, N.M., to negotiations which might have prevented the tragic effects of Hiroshima and Nagasaki."<sup>12</sup> Captain Kyuzo Tamura, IJN, agrees that "the result of the B-29 mining was so effective against shipping that it eventually starved the country. I think you probably could have shortened the war by beginning earlier."<sup>13</sup>

#### The Korean War

In 1950, the North Koreans mined six of their own ports as a defensive measure. Mines protecting Inchon were unsophisticated and sparse, and therefore did not prevent that famous landing. General MacArthur planned his second attack north employing amphibious maneuver to again take advantage of the coast. This time extensive minefields delayed the landing of 50,000 men at Wonsan for a week.<sup>14</sup>

#### The Vietnam War

In 1972, the United States was attempting to extricate itself from the Vietnam War, the Paris peace talks were at a standstill, and the Vietnamese had begun a major offensive. At President

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<sup>11</sup>Lott, p. 41.

<sup>12</sup>Ibid., p. 47.

<sup>13</sup>Navy, Strategic Bombing, p. 3.

<sup>14</sup>Melia, pp. 73-78.

Nixon's order, Navy A-6 and A-7 aircraft placed 36 mines in Haiphong harbor, closing the port for 300 days. Tamara Melia, a naval historian, contends that "continued remining and bombing of North Vietnam influenced negotiations in Paris through 1972 as the U.S. increased military pressure on the North Vietnamese to negotiate settlement."<sup>15</sup>

#### The Persian Gulf War

CINCCENT's campaign plan was founded upon a synergistic combination of air, ground and amphibious operations. Iraq laid extensive minefields in the northern Persian Gulf to protect its flank from seaward assault. The Department of Defense's (DOD) final report to Congress alludes to the MCM problems encountered.<sup>16</sup> USS Tripoli and USS Princeton were both crippled by mine explosions. DOD concluded that:

the Iraqi mine threat affected almost all naval operations during the Persian Gulf Conflict. The Coalition's ability to conduct amphibious operations and NGFS was constrained by the minefields in the northern Persian Gulf. The mine threat also affected naval air strike operations because it forced the carrier battle groups in the Persian Gulf to operate at greater ranges from targets in Iraq.<sup>17</sup>

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<sup>15</sup>Melia, p. 101.

<sup>16</sup>U.S. Dept. of Defense, Conduct of the Persian Gulf War (n.p., April 1992), p. 309.

<sup>17</sup>Ibid., p. 306.

## CHAPTER III

### MINING OBJECTIVES

#### Centers of Gravity

The most important facet of operational art, from planning to execution, is the identification and pursuit of military operational objectives. The operational commander must recognize the strengths of both his own forces and those of the enemy which are critical to achieving their respective objectives. The most important strengths are called the centers of gravity, which Clausewitz defined as the hub of all power and movement around which everything depends. Should a force's COG be successfully destroyed, that force will no longer be able to reach its goals. Therefore, if the commander judges a COG liable to attack, he is likely to make its damage or destruction one of his highest objectives. A minefield is one of the few conventional naval weapons which can be employed directly against a wide variety of strategic or operational COG's. Mining the North Sea effectively countered the U-boats, a German operational COG. The objectives of the Iraqi minefields were to cause damage to U.S. forces unacceptable to the public (strategic COG) and to counter amphibious forces (operational COG). Protecting one's own COG is also critical. Pre-emptive mining protected U.S. amphibious forces (operational) during the Hollandia landing.

#### Critical Weaknesses and Vulnerabilities

Operational artists usually cannot directly attack an enemy's COG; COG's are either inherently strong or the enemy will also

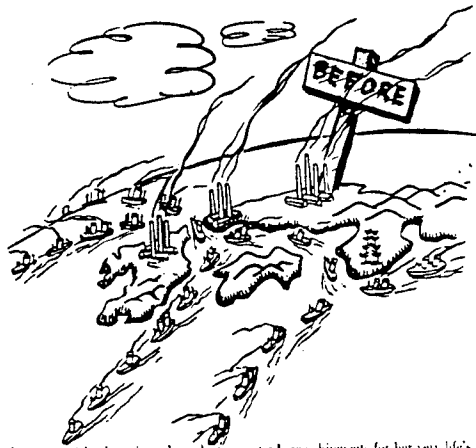
recognize their importance and properly defend them. Critical weaknesses, or those elements which are vital but open to attack, must be identified for both friendly and enemy forces. Critical weaknesses which are related to a COG are designated critical vulnerabilities. Minefields can exploit many critical weaknesses and vulnerabilities; to illustrate this point three common weaknesses are explored.

First, mining requires the enemy to either avoid the mined area or to conduct mine countermeasures (MCM), which are slow, tactically difficult, weather-dependent, expensive, and require air and sea superiority. Further, MCM can never keep up with properly executed mining, either in tempo or technology, and there are few nations in the world today which can effectively conduct MCM. Japanese forces in WW II and Coalition forces in the Persian Gulf War had to avoid areas which could not be kept cleared.

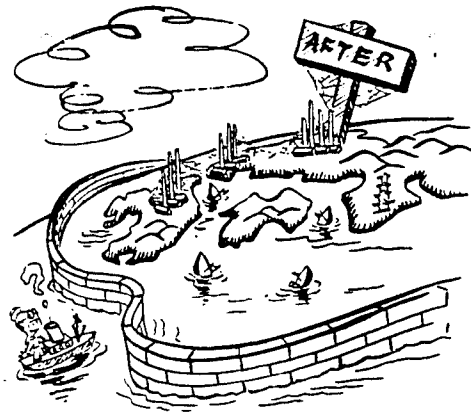
Another weakness, shared by all maritime nations, is choke points (such as channels, harbors, and sea lanes) through which ships must pass. A well-situated minefield can close a choke point to traffic, both on the surface and below it, or expose the enemy to severe losses. The minings of the North Sea and Haiphong harbor (WW II) were two successful choke point operations.

Perhaps the most common weakness--usually a vulnerability--among maritime nations (including the United States) is dependence on SLOC's. Mining can disrupt the maritime supply

TO SUM IT ALL UP . . .



Japan is an island empire—dependent on water borne shipments for her very life's blood. Millions of tons of shipping pass through her home waters each month, scurrying back and forth from the Asiatic mainland and forward areas, trying desperately to feed the all-consuming machines of war—so fight a nation many times her superior in productive strength . . .



Aircraft mines are going to place a solid wall around that island empire. And no matter how much the enemy disperses his strategic industries, or tries to go underground—he will not be able to evade this attack! Shipping cut off, his atomic home arsenal will shrivel up, leaving the Jap most vulnerable to our other forms of air attack—and—need we say it?—to EVENTUAL DEFEAT.

**Figure 1** The Effect of Operation Starvation.  
From Ellis A. Johnson and David A. Katcher. Mines Against Japan (Silver Spring, MD: Naval Ordnance Laboratory, 1947), p.88.

system by denying safe ports and shipping routes and sinking and damaging ships. Operation Starvation certainly exploited this vulnerability.

The savvy operational artist will place as much emphasis on ensuring friendly weaknesses are covered as he does on exploiting the enemy's. GEN MacArthur's second attempt to take advantage of North Korea's long coastline via amphibious maneuver was thwarted by Wonsan minefields.



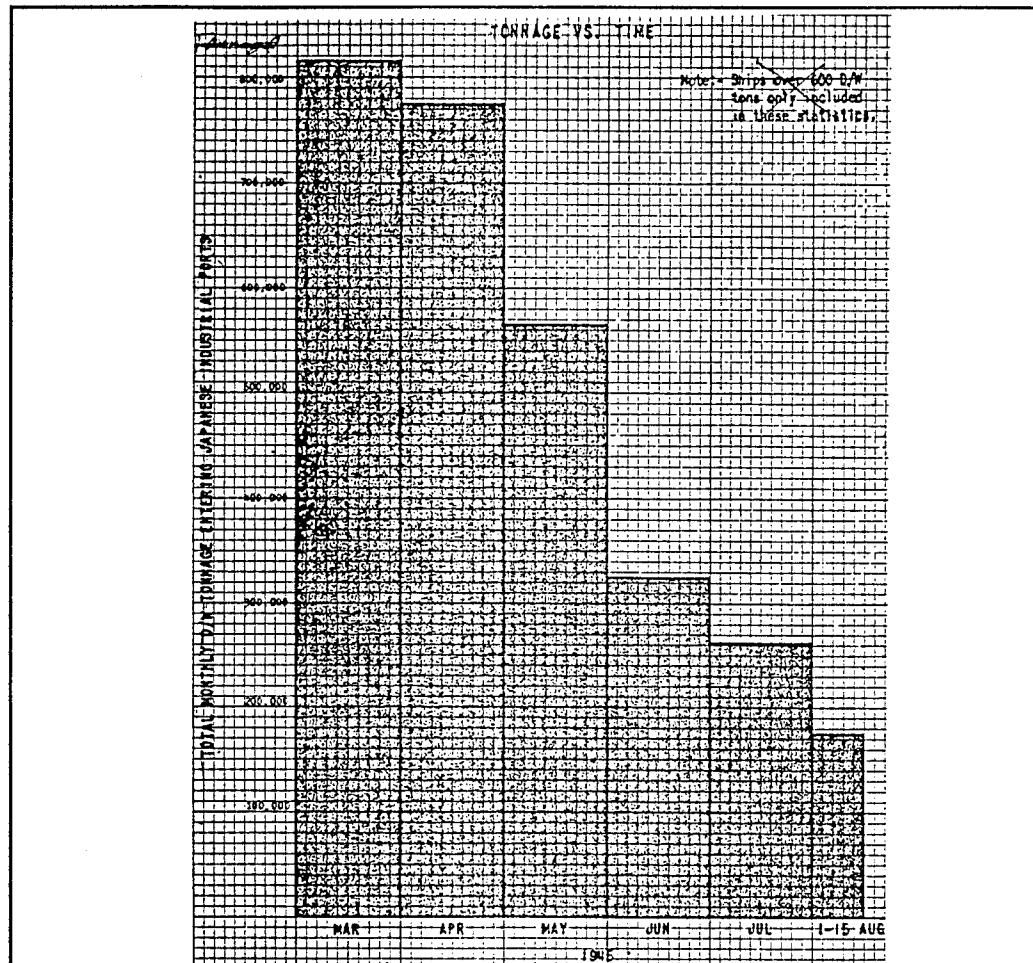
## Measures of Effectiveness

Throughout an operation, the commander will require updates on how well a weapon system is achieving its objectives. This is quantified in operations analysis by the use of an MOE. An MOE is dependent upon the objective and circumstances; the difficulty of choosing one increases proportionately with the level of conflict. MOE's are especially difficult to define for a minefield due to its unique characteristics of long-stay times, probable lack of battle damage assessment, and possible employment as a deterrent. Furthermore, different fields will have different objectives. Navy doctrine provides six mining MOE's which, though useful for a tactical model, are simply planning assumptions.<sup>18</sup> Historically, mining MOE's have been related to the amount of damage inflicted. The fact that 670 Japanese ships were sunk by mines during Operation Starvation does not in itself fully portray the extent to which mining affected Japanese industry (a strategic objective); deterrence and indirect effects were clearly factors. More useful MOE's might be linked to measuring such things as the rate of enemy maritime shipping, the number of enemy naval deployments, the time delay in enemy response, the delay in enemy resupply, or the amount of effort diverted to MCM; these MOE's might in turn be influenced by other factors such as naval surface and subsurface threats. The real success of mining is often indirect and usually difficult to measure. The operational artist is faced with the choice of either

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<sup>18</sup>U.S. Navy dept., Mining, NWP 27-4(B) (Washington: 1993), pp. 1-11--1-12.

building an MOE with his situation's strategic and operational objectives clearly in mind, choosing one of the existing MOE's knowing its limitations, or assuming a certain level of effect. The MOE's normally associated with Operation Starvation are impressive, but Figure 2 more accurately depicts mining's strategic success.



**Figure 2** A Measure of Operation Starvation's Effectiveness

From U.S. Navy dept., "The Offensive Mine Laying Campaign Against Japan," U.S. Strategic Bombing Survey (Washington: 1946), p. 8.

## CHAPTER IV

### MINING CAPABILITIES

#### U.S. Naval Mine Inventory

The United States maintains five different series of naval mines: the Mk 56, the Destructor, the Quickstrike, the Captor, and the SLMM. The Mk 56 is a 2000 pound air-dropped moored anti-submarine warfare (ASW) mine developed in the 1950's. The Destructor series consists of aircraft bombs which can be modified to act as shallow water bottom mines (these modification kits were developed because of a U.S. shortage of mines during the Vietnam war). The Quickstrike series is a follow-on to the Destructor series, with the Mk 65 being the only one specifically designed as a mine. Both the Destructor and Quickstrike "mines" are for shallow water anti-surface warfare (ASUW) or ASW only. The Captor is a deep-water moored ASW mine (developed in the 1970's) which launches a torpedo at a detected submarine. Finally, the SLMM is a submarine-launched torpedo modified for use as a shallow water mine for ASW or ASUW (developed in the early 1980's). Though the Quickstrike is currently being upgraded, there have been no new additions to the mine inventory for over eight years.

#### U.S. Minelaying Platforms

The U.S. military maintains the capability, on paper, to lay mines from ships, aircraft or submarines. Every mine in the inventory is designed for aircraft or submarine delivery, so a surface ship would have to be modified to lay mines. Aircraft have historically been used to lay minefields because of their

capability to drop numerous mines within a short time. Because many of the mines are modified bombs, any aircraft that can carry bombs can carry those mines. The Air Force's bombers are by far the most capable platforms in terms of weapons loadout and reach. The B-52 can carry all but the SLMM, and is the only high-volume platform in the inventory. The B-1B is mine capable, but it is limited to carrying the smallest Quickstrike mine and does not have mining as a mission area. The Navy's most capable aircraft is the A-6, which has few years of service life left. P-3's, S-3's and F/A-18's are capable of carrying small mine payloads.

Every attack submarine in the U.S. inventory can conduct mining, but severe space limitations mean that every mine takes the place of a torpedo or cruise missile. As in WW II, submarines can be used as minelayers when stealth is a prerequisite and a large volume of mines is not required.

## CHAPTER V

### MINE EMPLOYMENT

"In the art of war there are no fixed rules."  
Sun Tzu, The Art of War

#### Strategic Deterrent or Escalation

Mining a country's coastline can signal U.S. intent and commitment, but is a smaller escalation than actions which cause direct and visible damage. The act of mining would certainly be construed as a hostile act, but would only be conducted when that escalation was in the interest of the miner. The United States mined Vietnamese harbors in 1972 as a strategic escalation aimed at influencing the peace talks and obtaining the release of American prisoners of war.

#### Battlespace Dominance

Mining can be an integral part of the plan to attain battlespace dominance, incorporating the principles of surprise, offense, maneuver, and economy of force. Offensive mining can surprise the enemy, either because mining is unexpected, the enemy has no MCM capability, or minefields are laid covertly. The element of surprise can force the enemy into a defensive mode where he is reacting to friendly actions, giving the miner the initiative. The United States surprised the Japanese in WW II, and then were themselves caught offguard in the Persian Gulf War. To add deception, the operational commander can conceal minefield locations in order to restrict a larger area to the enemy or to make him believe that an area will not be used for an amphibious

landing. False minefields were employed throughout WW II.

Maneuver and battlespace dominance build upon one another; operational maneuver can be a key ingredient to achieving battlespace dominance, which in turn ensures further maneuver ability. Maneuver combines movement and mobility, both of which can be affected by mining. NDP 1 states that control of the sea can be accomplished by conducting barrier operations in choke points that prevent enemy mobility under, on or above the sea.<sup>19</sup> Minefields can be the key to ensuring the safe transition from the open ocean to the littoral areas by denying prior access to the enemy, as was accomplished in WW II to protect amphibious forces. The operational commander could then employ minefields to compress the enemy's battlespace, diverting enemy forces to the area he wishes to engage them in. Mining restricted the movement of both the German and Japanese fleets in WW II, resulting in the loss of each country's most powerful battleship. More recently, Iraqi minefields prevented a planned maneuver of Coalition forces.

Achieving economy of force in order to mass and maneuver forces for decisive battles is increasingly difficult because the U.S. military is shrinking and low-cost, high-threat weapon systems are widely available. The commander can secure an axis with minefields from surface or subsurface threats, allowing him to concentrate more forces in decisive areas. Perhaps the most well-known example is the mining of the North Sea. Minefields provide

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<sup>19</sup>U.S. Navy Dept., Naval Warfare, NDP 1 (Washington: 1994), p. 26.

operational fires, either lethal or non-lethal, which can be a significant force-multiplier. The damage to Tripoli and Princeton from lethal fires directly affected Coalition naval operations in the Persian Gulf. A Center for Naval Analysis study states that "there is considerable evidence from historical data and from laboratory testing that minefields exert a substantial psychological influence...on an enemy's maritime operations."<sup>20</sup> The study links the effectiveness of minefields as non-lethal weapons to the fact that the enemy cannot accurately determine the threat, there is no gray decision area (it is a go, no-go situation), and there will be no feedback until after the decision is implemented.<sup>21</sup> Minefields affected Japanese troop morale in Burma, and the threat of minefields stopped the U.S. amphibious maneuver in the Persian Gulf War.

Mining can also be employed defensively to maintain battlespace dominance by extending the battle timeline or by protecting friendly forces from enemy fires and maneuver. The operational commander can extend his timeline by employing minefields to delay actions until his forces are ready. Mining can likewise be employed to extend the littoral battlespace, which seems uncomfortably compressed to naval warriors accustomed to the long ranges of blue water operations. Minefields can be the outer line of a defense in depth, either deterring or attriting enemy

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<sup>20</sup>William L. Greer and others, Psychological Aspects of Mine Warfare (Alexandria, VA: Center for Naval Analysis, 1982), p.14.

<sup>21</sup>Ibid., p.14.

forces. The United States employed minefields to protect operational forces as they island-hopped across the Pacific.

Minefields can protect forces from the surface and subsurface combat power of the enemy, denying him its flanks. 39 nations now operate more than 400 diesel-electric submarines throughout the world, placing any naval ship at risk in the event that the enemy wields this stealthy weapon. Submarine sonars are not designed to detect mines, and one expert states that "...it is impossible to believe that any ship or submarine can either be sure of detecting or avoiding mines...."<sup>22</sup> The number of submarines sunk by mines in both World Wars attests to their vulnerability. Not only can minefields protect a naval force, but they can protect a land force from amphibious attack. Minefields can be placed along friendly-controlled coasts targeting every phase of an amphibious landing. Minefields successfully protected North Korea's Wonsan flank.

#### Power Projection

Power projection takes the battle to the enemy. Mines laid in the enemy's territorial waters (along the coast, in ports, or in rivers) by aircraft, ships (including submarines), small boats, or SOF can block major maritime lines of communication, both internal and external. Mines are difficult to find and counter, and are effective as long as the enemy believes they are present. Once a mine goes off, the enemy must prove that an area is safe before it can be transitted or accept an unknown risk. Six mines closed

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<sup>22</sup>Richard Compton-Hall, Submarine Warfare (Dorset, UK: Blandford Press, 1985), p.81.



Haiphong harbor in WW II, affecting Japanese military operations on the Asian continent.

### Mining Drawbacks

Drawbacks to mining include legal constraints, questions concerning the morality of their use, operational limitations, and extensive after-action requirements.

The lawful employment of naval mines is addressed in international law solely by the Hague Convention of 1907, which sought to ensure the safety of merchant shipping by requiring that mines be constructed so that they became inert should control of them be lost and by requiring that shipowners be warned of minefields **as soon as military exigencies permit**. NWP 9 lists current restrictions on the use of mines (during armed conflict) by U.S. forces, of which several are important to the operational artist:

1. Mines may be used to channelize neutral shipping, but not in a manner to impede the transit passage of international straits or archipelagic sea lanes.
2. Mines may **not** be emplaced off the coasts and ports of the enemy with the **sole** objective of intercepting commercial shipping.
3. Reasonably limited barred areas may be established by minefields, provided neutral shipping retains an alternate route with a reasonable assurance of safety.<sup>23</sup>

The Hague Convention could not have foreseen the advance of mine technology and therefore the provision often does not apply to current situations. A commander can declare military exigencies if

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<sup>23</sup>U.S. Navy dept., Commander's Handbook on the Law of Naval Operations, NWP 9(A) (Washington: 1989), pp. 9-2--9-3. Emphasis added.

secrecy is important, and mining enemy coasts is allowable as long as military forces are among the targets. The Allies kept the location of many minefields secret in WW II, and employed dummy mines on numerous occasions. Most minefields were declared, however, to enhance their deterrent effect.

Moral issues related to mining are important to the commander because of their possible effect on public opinion (probably a strategic COG). The most cited drawback to employing minefields is that the majority of mines in the world inventory are "blind," i.e. they cannot differentiate between ship types or nationalities. Another question concerning minefields is the environmental damage that mining and mine explosions would cause. Because mines are often used in shallow water and explode underwater, they could conceivably cause extensive damage to certain fragile ecosystems. Additionally, the victims of mines would doubtless spread contaminants. But there is no evidence that mining damages the environment more than other weapons.

There are many restraints to the operational use of minefields in the U.S. military. As mentioned earlier, mines do not provide the instant battle damage assessment of missiles, bombs, or guns. Though this may seem trivial, in an age when wars are shown live on CNN it can be argued that Americans believe what they see (are shown) and what they don't see, doesn't exist. Mines may be "weapons that wait," but Americans traditionally aren't patient. Therefore dwindling military resources (both dollars and time) are put into more stylish weapons. Another problem revolves around pre-

conceived rice bowls, or areas of responsibility. Though the military conducts joint planning and operations, the services maintain their autonomy as far as procurement and training is concerned. A major maritime mining operation would require aircraft from the Air Force (large mines require large aircraft) and mines from the Navy. There is also a lack of doctrine regarding the operational use of minefields. Though the Navy has recently updated the NWP 27 series, these publications address mining at the tactical level from the naval viewpoint only. The Navy and the Army air force overcame similar circumstances in WW II and achieved outstanding results. Finally, if the United States were to use its technological power to build a smaller and more capable mine, as soon as the first one is dropped the technology involved must be considered compromised. The possibility of this loss can be minimized by including anti-tamper and timing devices in the mine.

Another significant problem with mining is the requirement for post-conflict actions involving legal, moral, and operational issues. The commander must ensure that accurate records of minefields are maintained both for friendly force safety and to allow mine clearance after the conflict. These records list only where the miner **intended** the mines to be placed, but errors in navigation, environmental conditions (wind and current), and human error could result in numerous mines ending up in undesirable positions. On the positive side, mine clearance can be delayed until the mines are inert, the position of most of the mines are known, and the characteristics of every mine are known. The clean-

up of Japan after WW II was a significant undertaking, and WW II mines are still being found in the Baltic.

#### Mining Positive Attributes

Some further reasons that minefields should be considered for littoral operations: mines are inexpensive to acquire and deploy, but cost the enemy significant resources; mining combines stealth and stay-time; and minefields can be effective non-lethal fires. Minefields produce effects well beyond the proportion of effort expended in their execution, certainly an important factor in today's stringent financial environment. Based on today's costs, the United States could produce up to 25 modern mines for the cost of one Harpoon missile. To be sure, minefields increase their economic effect by causing the enemy to divert forces and resources to mine hunting and sweeping, mine spotting, modifying ships (such as adding degaussing), and conducting measures to prevent further mining. Iraqi minefields, laid by inexperienced personnel in small rubber boats, placed a huge MCM burden on Coalition forces.

Mines are the true "stealth" weapon, according to the Mine Warfare Plan of 1992. Even to the most capable minehunting ship many mines are nearly undetectable due to case construction (non-metallic material and non-reflecting shape), coverage by sea growth or bottom mud or sand, unfavorable water conditions, and the multitude of highly-reflective objects (such as old refrigerators) which often obscure them. Additionally, mines are persistent-- they can be left in place as non-lethal fires for months, and then instantly become lethal fires. The fact that there are still WW II

vintage mines being discovered in the Baltic serves as testament to their stealth and persistence. This combination, not found in other weapon systems, can have a severe psychological effect (non-lethal fire) on the morale of the enemy (both the general population and military). Perhaps most impressively, this combination also allows mines to accomplish their mission **without killing**. Declared minefields are a strong deterrent to maritime traffic, providing an effective non-lethal fire. Ships that enter them do so cognizant of their choices, hopefully translating to smaller numbers of non-combatant civilians killed. Operation Starvation deterred shipping and impacted the morale of the Japanese without arousing normal wartime hatred. Even more intriguing is the possibility that mining could have averted the nuclear bombing of Japan.



—CINCPAC JUST ACCEPTED ONE OF HIS  
PLANS AND NOW HE CAN'T FIND THE  
BLUEPRINT...

**Figure 3** Some Things Never Change.  
From Ellis A. Johnson and David A. Katcher. Mines Against Japan  
(Silver Spring, MD: Naval Ordnance Laboratory, 1947), p. 64.

## CHAPTER VI

### CONCLUSION

Maritime minefields have been employed to achieve strategic and operational objectives in the five major conflicts fought by Americans in this century. The changing face of the world presents an increasing challenge of how to prepare shrinking military forces to deal with a multitude of diverse regional crises; maritime minefields can be an important part of the solution. Mining can strike at the heart of the enemy, take advantage of a critical vulnerability, or protect one's own weaknesses. Forward states that the naval service can influence events ashore in support of U.S. interests in the world's littorals.<sup>24</sup> The U.S. maintains five series of naval mines which can be employed for ASW or shallow-water ASUW. Air Force bombers and Navy attack aircraft are capable minelayers, as are U.S. attack submarines.

Faced with a conflict involving an adversary with maritime ties, the operational commander should consider employing minefields as an integral part of his plan to achieve battlespace dominance and to project power. The legal constraints, moral questions, and operational restraints involved with mines cannot be overlooked, but are surmountable. Maritime minefields are a force and resource multiplier, costing the enemy far more to counter than was spent on placement. A minefield's unique combination of stealth and persistence can have a profound effect on the enemy, either via lethal or non-lethal fires. Finally, mining's quality of deterrence

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<sup>24</sup>Navy, Forward, p. 2.

may allow a commander to achieve objectives without killing.



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